

# (12) UK Patent Application (19) GB (11) 2 098 439 A

(21) Application No 8203902  
(22) Date of filing 10 Feb 1982  
(30) Priority data  
(31) 56/059832  
(32) 27 Apr 1981  
(33) Japan (JP)  
(43) Application published  
17 Nov 1982

(51) INT CL<sup>3</sup>  
B01J 19/12  
(52) Domestic classification  
H5R 24  
C3J 354 362 AC  
C3W 100 225 316  
C3Y B120 B123 B262  
B284 G320

(56) Documents cited  
None

(58) Field of search  
H5R  
H5H

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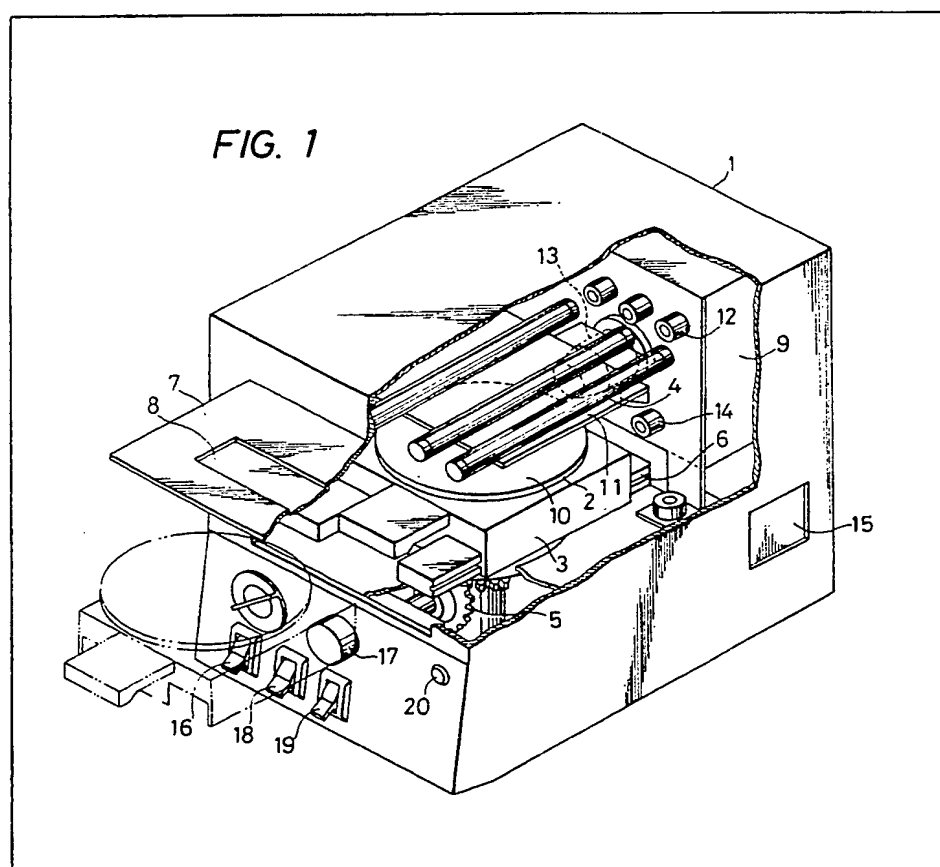
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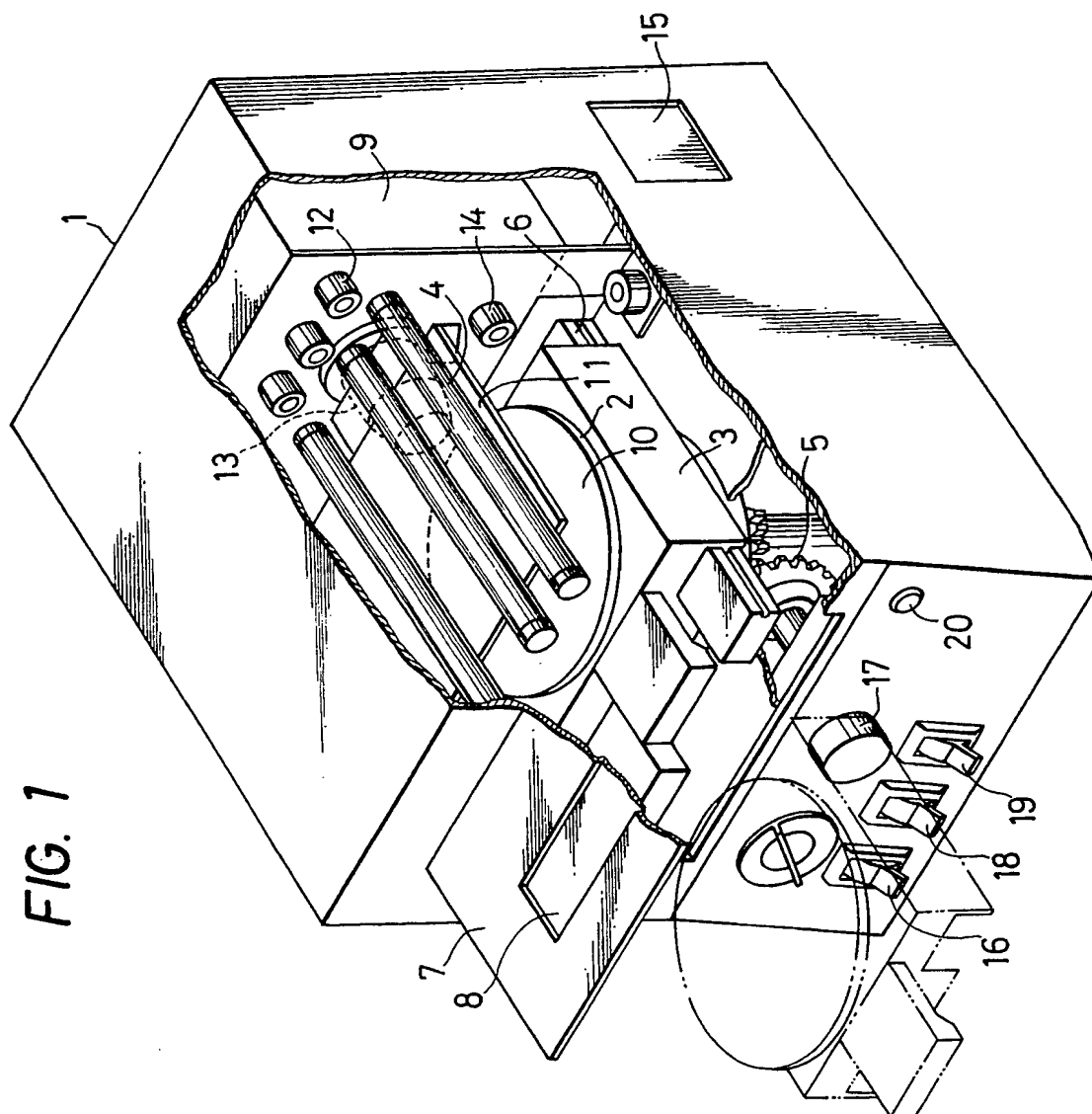
(54) Apparatus for curing resin films  
coated on dental resin prosthesis

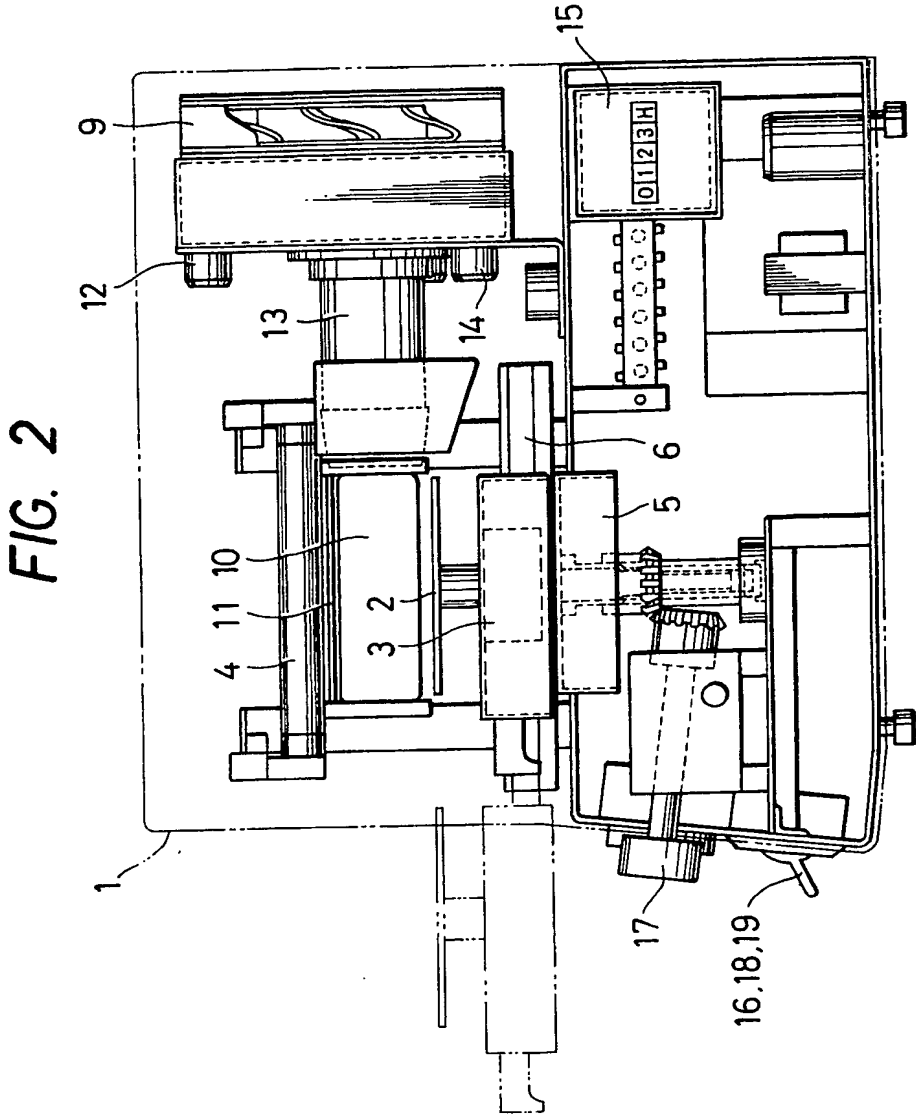
(57) Apparatus for curing resin films  
coated on dental prosthesis comprises  
a casing (1), a turntable (2) for  
supporting the prosthesis slidably  
disposed in the casing to be movable

in or out of the casing, a mechanism  
(5) for lifting and lowering the  
turntable by operation of a knob (17)  
arranged outside of the casing, and an  
activation energy-radiation lamp (4)  
disposed in the casing for emitting  
radiation toward the prosthesis. A  
door (7) is fitted on a wall of the  
casing and has a viewing window (8).



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## SPECIFICATION

**Apparatus for curing resin films coated on dental resin prosthesis**

The present invention relates to an apparatus  
5 for curing resin films coated on dental resin  
prosthesis, which is designed to coat the  
prosthesis with a photopolymerizable resin liquid  
on the surface thereof and cure or set resultant  
resin films by radiation emitted from a source of  
10 activation energy.

Conventional apparatuses for preparing plastics  
prosthesis coated with an abrasion resistant resin  
have several disadvantages: they encounter  
difficulties in obtaining uniform coating and render  
15 it impossible to make use of the radiation emitted  
from a source of activation energy with maximum  
efficiency, thus resulting in local fluctuations in the  
quality of cured resin films and failure to obtain a  
desired coating effect. This is because dental  
20 prosthesis have to be cured while placed on or  
suspended from a turntable kept at a fixed level in  
a casing.

The present invention provides apparatus for  
curing films coated on dental prosthesis,  
25 comprising a casing on a wall of which is fitted a  
door having a viewing window, a turntable for  
supporting the prosthesis slidably disposed in the  
casing to be movable in or out of the casing,  
means operable from outside of the casing for  
30 lifting and lowering the turntable, and an  
activation energy-radiation source disposed in the  
casing for emitting radiation toward the  
prosthesis.

A build-up of heat generated from the  
35 activation energy-radiation source *per se* and  
hence a lowering of the radiation intensity of  
activation energy may be prevented by blowing  
atmospheric air around the radiation source. A  
change in the shape of the prosthesis to be coated  
40 may also be avoided by blowing warm air  
regulated to a given temperature into a curing  
chamber defined by the turntable and a quartz  
plate disposed between the radiation source and a  
turntable. Optionally, the prosthesis together with  
45 the turntable can be removed by means of a  
slidable mechanism from in the casing without  
touching them with the hand. Therefore, the  
prosthesis can be set while maintaining a  
temperature suitable for the curing reaction of a  
50 coating material and the close contact of the  
coating material with the prosthesis. This  
ensures time-saving, easy and uniform coating.

The apparatus of the present invention also  
includes turntable-lifting or -lowering mechanism  
55 by which, during curing, the turntable can be  
visually aligned from the outside of the casing  
with the zone in which the radiation efficiency  
reaches a maximum, having regard to the shape of  
the prosthesis. In this connection, it is noted that  
60 the light intensity reaches a maximum at a  
position about 10 mm away from the radiation  
source in view of uniformity and other  
considerations, although it increases further at a  
position nearer to the lamp.

65 Thus, the apparatus of the present invention  
renders it possible to make optimum use of the  
activation energy radiation, and ensures time-  
saving and efficient curing. In addition, the  
apparatus of the present invention provides  
70 coatings of uniform quality.

The invention will be further described, by way  
of example only, with reference to the  
accompanying drawings, in which:

75 Figure 1 is a perspective view, partially cut  
away, of one embodiment of apparatus according  
to the present invention; and

Figure 2 is a sectional view of the apparatus  
shown in Figure 1.

The apparatus shown in the drawings  
80 comprises a casing 1 on a wall of which is fitted a  
door 7, a turntable 2 disposed in the casing for  
holding dental prosthesis, and a driving motor 3  
for rotating the turntable 2. The dental prosthesis  
held on the turntable 2 are exposed to the  
85 radiation emitted from a source of activation  
energy, while being rotated to receive uniformly  
thereover part of the radiation from the activation  
energy source reflected from a reflector plate  
arranged in the casing.

90 The radiation intensity of the activation energy  
source is in inverse proportion to the second  
power of the distance between the dental  
prosthesis and the activation energy-radiation  
source in the form of a lamp 4. It is then required  
95 that the dental prosthesis be positioned as close  
to the lamp 4 as possible. The prosthesis are  
preferably positioned about 10 mm away from the  
lamp 4 by vertically moving the turntable *via* a  
turntable-lifting and -lowering mechanism 5  
100 operated by a knob 17 arranged outside of the  
casing, while visually monitoring the turntable  
through a viewing window 8 formed in the door 7.  
This is because it is important to arrange the  
dental prosthesis in a zone in which the radiation  
105 efficiency of the light energy reaches a maximum,  
during curing. It is noted that the vertical  
movement of the turntable may be effected  
automatically.

The turntable 2 having the prosthesis thereon is  
110 longitudinally (or laterally) slidable out of the  
casing 1 by means of a horizontally movable  
sliding mechanism 6, while the height of the  
prosthesis is kept constant. Subsequent  
application of a coating liquid can be carried out  
115 easily and uniformly, since it is then feasible to  
coat the prosthesis in a stationary state without  
being subjected to any special limitations, while  
rotating the turntable.

With the activation energy-radiation lamp 4,  
120 the energy efficiency of which has a slight relation  
to the above-mentioned distance and varies  
largely dependent upon ambient temperature, a  
rise of ambient temperature causes a lowering of  
energy intensity, so that cooling of the lamp 4 is  
125 required. To this end, the lower portion of the lamp  
4 is separated from a curing chamber 10 by a  
quartz partition 11 to cool the circumference of  
the lamp 4 with atmospheric air. This air is  
obtained by the introduction of fresh air blown by

a fan 9 disposed in the casing 1. The fresh air thus introduced passes through inlets 12, 13 and 14 and is used to cool the lamp 4, warm the curing chamber 10 (with a heater disposed inside of the associated inlet 13) and cool the driving motor 3 for the turntable 2, respectively.

The curing chamber 10 defined by the quartz partition 11 and turntable 2 has a temperature prevailing therein that is not too high to cause deformation of the prosthesis, and is designed to promote curing of the prosthesis by blowing there-onto warm air heated up to about 60°C suitable for the curing reaction. The driving motor 3 for the turntable 2 is always cooled with atmospheric air introduced from the outside of the casing, and can be used for a longer period of time with no danger of overheating. This helps to extend the life of the motor.

The air flows fed by the fan 9 to cool the lamp 4 and control the temperature in the curing chamber 10 are mixed together to cool the casing 1 in its entirety, leaving the casing through a discharge port. Since in this way use is effectively made of the radiation emitted from the source of activation energy, the curing reaction can be efficiently carried out for a shorter period of time and provide coatings of uniform quality.

Preferably, the casing should be formed of a material capable of resisting the light and heat emanating from the lamp 4, such as a metal. The casing preferably also has an internal structure that includes a reflection mechanism to reflect and condense light.

The activation energy-radiation lamp 4 may be any type of lamp capable of giving off activation energy radiation, and may be for example a high- or low-pressure mercury lamp or a lamp capable of giving off ultraviolet rays or visible light.

One or more radiation lamps 4 may be used in combination. A lighting circuit for the lamp 4 may be of the a.c. type; however, it is more preferably of the d.c. type (i.e. the high frequency type), since further increase in energy efficiency is obtained.

The drawings also show an integrator 15, a main switch 16, a driving motor switch 18, a lamp

switch 19 and an indicating lamp 20.

The dental prosthesis to be used in the curing apparatus according to the invention typically includes dentures and dental plates formed of materials of resins or resin compositions such as methyl methacrylate polymers or copolymers or polycarbonates.

#### CLAIMS

1. Apparatus for curing films coated on dental prosthesis, comprising a casing on a wall of which is fitted a door having a viewing window, a turntable for supporting the prosthesis slidably disposed in the casing to be movable in or out of the casing, means operable from outside of the casing for lifting and lowering the turntable, and an activation energy-radiation source disposed in the casing for emitting radiation toward the prosthesis.

2. Apparatus as claimed in Claim 1, in which the activation energy-radiation source is an ultraviolet lamp.

3. Apparatus as claimed in Claim 1, in which the activation energy-radiation source is a visible radiation lamp.

4. Apparatus as claimed in any of Claims 1 to 3, in which a quartz partition is interposed between the activation energy-radiation source and the turntable.

5. Apparatus as claimed in Claim 4, further comprising an air inlet disposed for blowing warm air regulated to a given temperature into a casing chamber formed between the quartz partition and the turntable.

6. Apparatus as claimed in any of Claims 1 to 5, in which a reflecting plate is disposed on the inner surface of the casing.

7. Apparatus as claimed in any of Claims 1 to 6, in which the said means for lifting and lowering the turntable is operable by a knob arranged outside of the casing.

8. Apparatus according to Claim 1 for curing resin films coated on dental prosthesis, substantially as herein described with reference to, and as shown in, the accompanying drawings.

